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LEE & HAYES PLLC 421 W RIVERSIDE AVENUE SUITE 500 SPOKANE, WA 99201			SEALEY, LANCE W	
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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/651,880

Applicant(s)

MARSCHNER ET AL.

Examiner

Lance W. Sealey

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 26 June 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-5, 10 and 19-63 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 29-45 and 52-63 is/are allowed.
- 6) ☒ Claim(s) 1-5, 10, 19-28 and 46-51 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

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DETAILED ACTION

Allowed Subject Matter

1. Claims 29-45 and 52-63 are allowed because no prior art anticipates or suggests, in a facial expression transformation system, a second code book in addition to a first code book and a training system of expressions (claim 29). Nor does any prior art anticipate or suggest, in a facial expression transformation method, computing a set of linear predictors a_j , one for each coordinate of g_a , given a set of n expression vectors for a face to be transformed, $g_{a1...n}$, and a corresponding set of vectors for a target face, $g_{b1...n}$, by solving $3m$ linear least square systems of the form $a_j \cdot g_{ai} = g_{bi}[j], i=1...n$, wherein said computing comprises using only a subset of points for each g_{aj} . (claim 52), controlling the spread of singular values when computing a pseudoinverse to solve for the a_j (claim 54), projecting a pattern onto a face for the purpose of ascertaining structure data (claim 56), capturing both specularly-suppressed reflection data and structure data from the simultaneous illumination of a second person's face with one light source that is polarized and one structured light source that projects a pattern onto the face (claim 57), and processing surface normals and image data to derive an albedo map in the process of providing data defining a second set of facial expressions (claim 61). Claims 30-45 are allowed, and claims 53, 55, 58-60 and 62-63 are allowable, because they depend on claims 29, 52, 54, 57 and 61, respectively.

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Claim Rejections – 35 U.S.C. 103

19. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains.

Patentability shall not be negated by the manner in which the invention was made.

20. Claims 1-5 and 19-28 are rejected under 35 U.S.C. 103(a) as being unpatentable over LaChapelle (U.S. Pat. No. 6,163,322).

21. With respect to claim 1, LaChapelle discloses a facial expression transformation method comprising:

- defining a code book containing data defining a first set of facial expressions of a first person (col.4, ll.29-46, especially ll.38-39; the “code book” is the recordation of all the movements of the facial markers at each frame, and this recordation inherently would include the recordation of the state of the facial markers at the first frame, which would correspond to data defining a first set of facial expressions of a first person);
- providing data defining a second set of facial expressions, the second set of facial expressions providing a training set of expressions of a second person who is different from the first person (database of expressions; col.8, ll.22-25); and
- deriving a transformation function from the training set of expressions and corresponding expressions from the first set of expressions (mapping template, col.9, ll.43-51. It is inherent that the transformation function in the mapping template is derived because for this transformation to work, the transformation function would have to be different for each pair of performer’s faces and database

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entries).

- applying the transformation function to the first set of expressions to provide a synthetic set of expressions (registration stage **102**, FIG.1 and col.9, ll.43-51).

21. Regarding claim 2, LaChapelle does not explicitly disclose the training set of expressions as containing fewer expressions than the code book. However, it is obvious to a person with ordinary skill in the art that this could occur because creation of the number of expressions via tracking movements of the face of a performer does not depend on the number of expressions in the database. See col.4, ll.29-46.

5. Concerning claim 3, LaChapelle further discloses the transformation function compensating for differences in the size and shape of the faces of the first and second persons (col.10, ll.54-57).

6. Regarding claim 4, LaChapelle further discloses the derivation of the transformation function comprising a linear transformation processor (col.10, ll.34-38).

7. Regarding claim 5, LaChapelle further discloses the transformation processor deriving the transformation function by:

- representing each expression as a $3m$ -vector that contains x , y , z displacements at m standard sample positions (ξ_i , col.4, ll.63-66); and
- computing a set of linear predictors a_j , one for each predictor of g_a , given a set of n expression vectors for a face to be transformed, $g_{a1...n}$, and a corresponding set of vectors

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for a target face, $g_{b1...n}$, by solving $3m$ linear least squares systems of the form: $a_j \bullet g_{aj} = g_{bi[j]}, i=1...n$ (computation of λ in col.5, ll.8-18).

8. With respect to claim 19, LaChapelle discloses one or more computer-readable media having computer-readable instructions thereon which, when executed by a computer, cause the computer to:
 - operate on a training set of expressions from one person (database of expressions; col.8, ll.22-25) and corresponding expressions from a code book of another person (col.4, ll.29-46) to compute a linear transformation function from the training set and their corresponding expressions (mapping template; col.9, ll.43-51. The neutral facial expression E_0 is the source of the facial expressions in the database; see col.8, ll.45-48); and apply the transformation function to a plurality of expressions from the code book to provide a synthetic set of expressions (col.10, ll.26-40).
9. Concerning claim 20, LaChapelle further discloses the instructions causing the computer to use the synthetic set of expressions to transform expressions from the one person into expressions of the other person (col.9, ll.43-51).
10. Regarding claim 21, LaChapelle further discloses instructions causing the computer to transform expressions from the one person that are different from those expressions comprising the code book expressions (mapping template, col.9, ll.43-51).
11. With respect to claim 22, LaChapelle further discloses instructions causing the computer

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to transform expressions from the one person that are different from those expressions comprising the code book expressions (markers, col.9, ll.43-47).

12. Regarding claim 23, LaChapelle further discloses instructions causing the computer to transform facial expressions (mapping template, col.9, ll.43-51).

13. Concerning claim 24, LaChapelle further discloses a facial expression transformation system comprising:

- a code book embodied on a computer-readable medium, the code book containing data defining a first set of facial expressions of a first person (col.4, ll.29-46);
- data embodied on a computer-readable medium, the data defining a second set of facial expressions, the second set of facial expressions providing a training set of expressions of a second person who is different from the first person (database of expressions; col.8, ll.22-25); and
- a transformation processor configured to derive a transformation function from the training set of expressions and corresponding expressions from the first set of expressions (mapping template, col.9, ll.43-51. The neutral facial expression E_0 is the source of the facial expressions in the database; see col.8, ll.45-48).

14. Regarding claim 25, LaChapelle further discloses the transformation processor comprising a linear transformation processor (col.10, ll.34-38).

15. With respect to claim 26, LaChapelle further discloses the expression transformation

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system comprising a synthetic set of expressions embodied on a computer-readable medium, the synthetic set of expressions being derived by applying the transformation function to the code book expressions (col.9, ll.43-51).

16. Concerning claim 27, LaChapelle further discloses the transformation function compensating for differences in the size and shape of the faces of the first and second persons (col.10, ll.54-57).

17. Finally, regarding claim 28, LaChapelle further discloses the transformation processor deriving the transformation function by:

- representing each expression as a $3m$ -vector that contains x , y , z displacements at m standard sample positions (\mathcal{E}_i , col.4, ll.63-66); and
- computing a set of linear predictors a_j , one for each coordinate of g_a , given a set of n expression vectors for a face to be transformed, $g_{a1...n}$, and a corresponding set of vectors for a target face, $g_{b1...n}$, by solving $3m$ linear least squares systems of the form: $a_j \cdot g_{ai} = g_{bi}[j], i=1...n$ (computation of λ in col.5, ll.8-18).

8. Therefore, in view of the foregoing, claims 1-5 and 19-28 are rejected as unpatentable under 35 U.S.C. 103 by LaChapelle.

23. Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over LaChapelle in view of Parke et al., Computer Facial Animation ("Parke").

24. LaChapelle does not disclose illuminating the second person's face with illumination and

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contemporaneously capturing structure data describing the face's structure and reflectance data describing reflectance properties of the face from the illumination. However, these elements are disclosed by the Parke animation textbook. Illuminating the second person's face is disclosed by Parke in Section 5.7.2, pp.183-185, and capturing the structure data is disclosed by Parke at Section 5.6, p.170, first full paragraph.

25. Therefore, it would have been obvious to one of ordinary skill in the art at the time this invention was made to incorporate the illumination elements of Parke into the LaChapelle animation apparatus. This would provide optimal lighting for whatever purpose is needed (Parke, pp.183-185).

26. Therefore, in view of the foregoing, claim 10 is rejected as being unpatentable under 35 U.S.C. 103 by LaChapelle and Parke.

27. Finally, claims 46-51 are rejected under 35 U.S.C. 103(a) as being unpatentable over Georgiev (U.S. Pat. No. 6,351,269) in view of Parke.

28. With respect to claim 46, Parke discloses a method of animating facial features comprising defining a subdivision surface that approximates geometry of a plurality of different faces ("Variable Topology", pp.95-96).

29. However, Parke does not disclose fitting the same subdivision surface to each of the plurality of faces to establish a correspondence between faces and using the correspondence between the faces to transform an expression of one face into an expression of another face.

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These elements are disclosed by Georgiev at col.4, ll.47-61 (the “subdivision surface” is the 3-image morphing in l.57. The 3-image morphing is a “subdivision surface” because any given morphing constitutes a “subdivision” of different expressions (see col.4, ll.36-43). The “correspondence between the faces” is the “transport” of a facial expression from one image to another (see col.4, ll.47-49). Finally, the same subdivision surface can be applied to a plurality of faces using the change vector (see col.4, ll.60-61)).

30. Therefore, it would have been obvious to one of ordinary skill in the art at the time this invention was made to incorporate the Parke approximation of facial geometry into the Georgiev method of morphing. This would increase flexibility in animation because new faces could be produced from old ones that are not of the same shape (topology). Parke, p.95, “Variable Topology”, first sentence.

31. The other claims in this rejection will now be considered. With respect to claim 47, Parke discloses:

- measuring 3-dimensional data for a plurality of different faces to provide corresponding face models (Section 3.4, p.66, first sentence of first paragraph and first bullet); and
- defining only one generic face model that is to be used to map to each corresponding face model (p.94, section marked “Fixed Topology”, fifth sentence on p.95).

Georgiev discloses:

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- selecting a plurality of points on the generic face model that are to be mapped directly to corresponding points on each of the corresponding face models (col.4, ll.11-29; all points are automatically selected on the generic face model to be mapped directly to corresponding points on each of the corresponding face models via the change vector).
- fitting the generic face model to each of the corresponding face models, said fitting comprising mapping each of the selected points directly to the corresponding points on each of the corresponding face models (col.4, ll.60-61).

34. Concerning claim 48, Parke discloses defining a subdivision surface from a base mesh structure, the subdivision surface containing a plurality of vertices and approximating the geometry of the face models (p.95, Figure 3.17 and first full paragraph); and manipulating only the positions of the vertices of the subdivision surface (p.94, section marked “Fixed Topology”, next to the last sentence).

35. Regarding claims 49 and 50, Parke discloses manipulating a base mesh that defines a subdivision surface without altering the connectivity of the base mesh (p.94, section marked “Fixed Topology”, next to the last sentence).

36. Finally, regarding claim 51, Parke discloses using a laser range scan to measure the 3-dimensional data at p.78, Section 3.7, first two sentences.

37. Therefore, in view of the foregoing, claims 46-51 are rejected as being unpatentable under 35 U.S.C. 103 by Parke and Georgiev.

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Response to Remarks

38. The Applicants' arguments begin on p.22 of their response. First, the Applicants assert that the Office has not established a *prima facie* case of obviousness because the stated motivation for making the combination of LaChapelle and Georgiev is not communicated with specificity and particularity as *In re Kotzab* requires ("particular findings must be made as to the reason the skilled artisan, with no knowledge of the claimed invention, would have selected these components for combination in the manner claimed", 55 USPQ2d at 1317). Since the rejection of claims 1-5 has been changed into a 35 U.S.C. 103(a) rejection involving only LaChapelle, response to this argument will be addressed based on this change.

47. The examiner, having read *Kotzab*, notes that *Kotzab* gives no guidance as to how many, or what quality, of "particular findings" are sufficient to establish a *prima facie* case of obviousness. Also, the examiner wonders whether *Kotzab* is on point in this particular instance because the problem the Federal Circuit had with the examiner and the Board's position was whether the examiner and the Board could maintain that the "one system" in the examiner's reference was equivalent to *Kotzab*'s "one sensor" when the examiner's reference used both terms "system" and "sensor", and the term "sensor" in the examiner's reference meant something different than the term "sensor" in the *Kotzab* invention:

Specifically, there is not substantial evidence to show that "one system" is the same as "one sensor". The words "sensor" and "probe" are used throughout Evans to refer to the device that measures the mold temperature. Evans uses the word "signal" to refer to the response generated by the measured temperature that controls the volumes for coolant flow. Finally, the word

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“system” is used in Evans to refer to the overall temperature control system that is responsible for the valve timing for coolant flow to increase or decrease the temperature of the mold. Evans clearly never uses the term “system” as a substitute for the simple temperature measuring device it calls “sensor”. And, the Board made no reference to any evidence in the record that would equate “one system” with “one sensor”. As mentioned previously, more than a mere scintilla of evidence is necessary to support the implicit conclusion that “one system” is equivalent to “one sensor”. Based on the entirety of Evans’ disclosure, we cannot say that there is such relevant evidence as a reasonable mind might accept as adequate to support the conclusion that “one system” means “one sensor”. 55 USPQ2d at 1317 (underlining added by examiner for emphasis).

Since there is no instance in which a term in the Applicants’ disclosure is equated to a different term in LaChapelle when LaChapelle already uses the term in the Applicant’s disclosure to describe something else, *Kotzab* does not apply.

48. With respect to a specific standard to establish a *prima facie* case of obviousness, MPEP 2143 (Feb. 2003 revision) only requires three criteria:

- (1) There must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings;
- (2) There must be a reasonable expectation of success; and
- (3) The prior art references (or references when combined) must teach or suggest all the claim limitations.

Concerning prong (1) above, the MPEP continues, teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, not applicant’s disclosure. *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991).

49. Applying the MPEP criteria for making a *prima facie* case of obviousness to the elements of claims 1-5 disclosed in LaChapelle, explanations as to why differences between LaChapelle

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and Applicants' claims are obvious are now explained in the rejections of claims 1-5 above; therefore, prong (1) is fulfilled.

50. Regarding prong (2) above, the combination of LaChapelle with itself would obviously have a reasonable expectation of success.

51. However, the bulk of the Applicants' assertions concern the Office's inadequate compliance with prong (3) above in presenting a *prima facie* case for obviousness, and these Applicant concerns will now be addressed.

52. The Office appreciates the Applicants' attempt to present every conceivable example of how LaChapelle and Georgiev cannot possibly disclose the elements of claim 1, and the Office admits that it could have done a better job with providing even *one* example of how LaChapelle and Georgiev disclose the Applicants' claim elements. It is such a thorough treatment of the combination of these two references by the Applicants which led the Office to look at these two references again and decide that the claims could be rejected with only LaChapelle.

53. If the Applicants would look to the rejection of claim 1 above, they will see how the examiner interpreted the claim limitations of this independent claim, and how the examiner's interpretation of how LaChapelle could be used to reject claims 1-5 did not completely match either of the Applicants' hypothetical application of LaChapelle to the Applicants' claims. The examiner expects that the explanations given for the rejection of claim 1 will address all of the assertions made by the Applicants concerning claims 1-5.

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54. The rejection of claims 19-28 above are supplied with less explanation than the rejection of claim 1 because the examiner's concept of how the code book, the training set of expressions, and the transformation function manifest themselves in LaChapelle have already been explained in the rejection of claim 1. However, there are some Applicant assertions about the rejections of claims 19-23 that have not been treated in the rejection of claim 1, namely:

(1) The first element of claim 19 recites "operate on a training set of expressions from one person and corresponding expressions from a code book of another person to compute a linear transformation function from the training set and their corresponding expressions." LaChapelle, on the other hand, simply maps points on a performer's face to a single neutral expression. (p.28 of response)

The characterization the Applicants themselves made of the LaChapelle reference earlier in their response (p.21) is the more accurate one:

As instructed in column 10, lines 26-40, an animated sequence can be obtained by constructing one facial expression for each time frame and interpolating the result for the time between frames. That is, the animation apparatus creates the desired expression E_f corresponding to the motion of the markers by using the set of n basic facial expressions and the neutral expression E_0 stored in the database of basic facial expressions. (underlining supplied by examiner for emphasis)

(2) In addition, the LaChapelle matching template is not a transformation function as that term is utilized in this claim and contemplated in Applicants' specification. (p.28 of response)

The LaChapelle matching template has already been shown to be a transformation function as that term is utilized in the Applicants' claims in the rejection of claim 1 above. As for the Applicants' claim that a matching template needs to be a transformation function as contemplated in the Applicants' specification, a term in the claim only needs to be interpreted using its plain meaning consistent with the specification. MPEP 2111.01. Since both

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Applicants' transformation function and LaChapelle's matching template aid in facial transformations, the claim has been interpreted appropriately.

55. With respect to claims 46-51, in response to the Applicants' assertion that the Office has not properly met its burden of establishing a *prima facie* case of obviousness for the 35 U.S.C. 103(a) combination of Parke with Georgiev for the rejection of claims 46-51, the Office has designated Georgiev as the main reference rather than Parke because the Office acknowledges that Parke does not suggest Georgiev, but Georgiev suggests Parke.

57. In light of the change to Georgiev as the main reference, we now test whether the Office has met its burden of establishing a *prima facie* case of obviousness for the combination of Georgiev with Parke using MPEP 2143:

- (1) There must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings;
- (2) There must be a reasonable expectation of success; and
- (3) The prior art references (or references when combined) must teach or suggest all the claim limitations.

Concerning prong (1) above, the MPEP continues, teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, not applicant's disclosure. *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991).

58. Applying the MPEP criteria for making a *prima facie* case of obviousness to the combination of Georgiev with Parke to reject claims 46-51, with respect to prong (1), the rejection of these claims states that the motivation for combining Georgiev with Parke is found in

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the first sentence of the “Variable Topology” section of Parke on p.95. Since the motivation for combining these two references is found in the prior art (Parke), prong (1) is fulfilled, no matter how broad the motivation.

59. Regarding prong (2) above, the combination of Georgiev with Parke would have a reasonable expectation of success because Georgiev discloses morphing among multiple images and Parke improves on Georgiev by providing for changes between faces when the faces do not have the same shape.

60. With respect to the Applicants’ assertions concerning the Office’s inadequate compliance with prong (3) above in presenting a *prima facie* case for obviousness in claims 46-51, these concerns will now be addressed.

61. Concerning the Applicants’ objections to the rejection of claims 46 and 47, the rejection of claim 46 above has been enhanced to show how the claim limitations of “fitting the same subdivision surface to each of the plurality of faces to establish a correspondence between the faces and using the correspondence between the faces to transform an expression of one face into an expression of another face” and the rejection of claim 47 above has been enhanced to show how the claim limitations of “fitting the generic face model to each of the corresponding face models, said fitting comprising mapping each of the selected points directly to the corresponding points on each of the corresponding face models” are fulfilled by Georgiev.

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62. Since changes have been made in art and grounds for rejection, this latest rejection will be non-final.

Conclusion

Any inquiry concerning this communication or earlier communications from the Office should be directed to the examiner, Lance Sealey, whose telephone number is (703) 305-0026. He can be reached from 7:00 am-3:30 pm Monday-Friday EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mark Zimmerman, can be reached at (703) 305-9798.

Any response to this action should be mailed to:

MS Non-Fee Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

or faxed to:

(703) 872-9306

Hand-delivered responses should be brought to Crystal Park II, 2121 Crystal Drive,
Arlington, VA, Sixth Floor (Receptionist).


MARK ZIMMERMAN
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2600